

2025 HAWKS MUREP PRECOLLEGE SUMMER INSTITUTE

PSI SITE NAME:

University of Maryland Eastern Shore

PSI PROGRAM NAME: HAWKS MUREP PSI

DATE: July 14, 2025

AWARD NUMBER: 80NSSC23M-0090

PI NAME: Dr. Joseph O. Arumala

Co PI NAME: Dr. Ibibia K. Dabipi

DATES OF IMPLEMENTATION: July 13 – July 25, 2005

NUMBER OF STUDENTS: 18

SUMMER RESIDENTIAL EXPERIENCE PLAN

SCHEDULE OF ACTIVITIES

Week 1 Sunday, July 13, 2025 Participants Arrive on UMES Campus and check into University Terrace from 4:00 p.m. DINNER: SSC 5:00 PM – 6: PM			
Week 1			
Monday, July 14, 2025			
	Activity	Location	Assigned to
6:00 AM – 7:30 AM	Wake-Up & Personal Grooming	University Terrace	Residence Assistant

8:00 AM – 9:00 AM	Breakfast	SSC	Resident Assistant
9:30 AM – 11:00 AM	UMES Campus Tour, Facilities & Laboratories	UMES	Dr. Dabipi & Dr. Zhang
11:00 AM – 1:00 PM	Lunch	SSC***	Student Assistant
1:30 PM – 4:00 PM	An Integrative Communication Analysis Framework for Team Collaboration and Personal Self- Navigation of Performance Pathways	EASC**	Drs. Dabipi & Brown
4:30 PM – 6:00 PM	Dinner	SSC***	Student Assistance
6:30 PM – 9:00 PM	App Development with Apple Xcode	EASC**	Dr. Stone
9:30 PM – 6:00 AM	Retire to Rooms for the Night.	University Terrace	Residence Assistant

Week 1			
Tuesday, July 15, 2025			
	Activity	Location	Assigned To
6:00 AM – 7:30 AM	Wake-Up & Personal Grooming	University Terrace	Residence Assistant
8:00 AM – 9:00 AM	Breakfast	SSC***	Residence Assistant
9:30 AM – 10:30 AM	SAT Preparation - English Session	EASC**	Ms. Karen Carroll
10:30 AM - 11:30 AM	SAT Preparation - Mathematics Session	EASC** 1162	Mohammed Salih
11:30 AM – 1:00 PM	Lunch	SSC***	Student Assistant
1:30 PM – 4:00 PM	An Integrative Communication Analysis Framework for Team Collaboration and Personal Self-Navigation of Performance Pathways	EASC***	Drs. Brown & Dabipi
4:30 PM - 6:00 PM	Dinner	SSC***	Student Assistant
6:30 PM – 9:00 PM	STEM Mentoring	EASC***	Drs. Mei & Dodoo
9:30 PM- 6:00 AM	Retire to Rooms for the Night	University Terrace	Resident Assistant

Week 1			
Wednesday, July 16, 2025			
	Activity	Location	Assigned To
6:00 AM - 8:00 AM	Wake-Up & Personal Grooming	University Terrace	Residence Assistant
8:00 AM – 9:00 AM	Breakfast	SSC**	Residence Assistant
9:00 AM – 4:00 PM	Dover Airforce Base Museum, Delaware	Dover, Delaware	Dr. Dodoo
4:00 PM – 6:00 PM	Dinner	SSC**	Student Assistant
6:00 PM – 9:00 PM	Reflection on day's activities and briefing for next day's activities.	EASC*	Drs. Stone & Dodoo
9:30 PM – 6:00 AM	Retire to Rooms for the Night	University Terrace	Residence Assistant

Week 1			
Thursday, July 17, 2025			
	Activity	Location	Assigned To
6:00 AM – 7:30 AM	Wake-Up & Personal Grooming	University Terrace	Resident Assistant
8:00 AM – 9:00 AM	Breakfast	SSC**	Resident Assistant
9:00 AM – 4:00 PM	An Integrative Communication Analysis Framework for Team Collaboration and Personal Self-Navigation of Performance Pathways	EASC*	Drs. Brown & Dabipi
4:30 PM - 6:00 PM	Dinner	SSC**	Student Assistant
6:30 PM – 9:00 PM	App Development with Apple Xcode	EASC*	Dr. Stone
9:30 PM- 6:00 AM	Retire to Rooms for the Night	University Terrace	Resident Assistant

Week 1			
Friday, July 18, 2025			
	Activity	Location	Assigned To
6:00 AM – 7:30 AM	Wake-Up & Personal Grooming	University Terrace	Resident Assistant
8:00 AM – 9:00 AM	Breakfast	SSC**	Resident Assistant
9:30 AM – 10:30 AM	SAT Preparation - English Session	EASC*	Ms. Carroll
10:30 AM - 11:30 AM	SAT Preparation - Mathematics Session	EASC*	Mr. Salih
11:30 AM – 1:00 PM	Lunch	SSC**	Student Resident
1:30 PM – 4:00 PM	An Integrative Communication Analysis Framework for Team Collaboration and Personal Self-Navigation of Performance Pathways	EASC*	Drs. Dabipi & Brown
4:30 PM - 6:00 PM	Dinner	SSC**	Resident Assistant
6:30 PM – 9:00 PM	Beginners Guide to Aerodynamics	EASC*	Drs. Dabipi & Dodoo
9:30 PM- 6:00 AM	Retire to Rooms for the Night	University Terrace	Resident Assistant

SATURDAY, JULY 19, 2025

Activity:

**BUILDING A BETTER LIFE – CONCRETE STEPS TO SUCCESS
WORKSHOP**

Time:

8:00 AM – 4.00 PM

Venue:

ATC* 1162

PRESENTER: MR. JOEL OPPENHEIMER

SUNDAY, JULY 20, 2025

Activity:

CRITICAL THINKING THROUGH CHESS

Time:

12:30 PM – 4: 00 PM

Venue:

ATC* 1162

LEADER: DR. JOSEPH D. DODOO

Week 2**Monday, July 21, 2025**

	Activity	Location	Assigned To
6:00 AM – 7:30 AM	Wake-Up & Personal Grooming	University Terrace	Resident Assistant
8:00 AM – 9:00 AM	Breakfast	SSC**	Resident Assistant
9:30 AM – 10:30 AM	SAT Preparation - English Session	EASC*	Ms. Carroll
10:30 AM - 11:30 AM	SAT Preparation - Mathematics Session	EASC*	Mohammed Salih
11:30 AM – 1:00 PM	Lunch	SSC**	Student Assistant
1:30 PM – 4:00 PM	The Basic Concepts of the Physics of Electricity and Magnetism	Hazel Hall, UMES	Dr. Das
4:30 PM - 6:00 PM	Dinner	SSC**	Resident Assistant
6:30 PM – 9:00 PM	VR/AR Workshop	EASC*	Dr. Zhang
9:30 PM- 6:00 AM	Retire to Rooms for the Night	University Terrace	Resident Assistant

Week 2			
Tuesday, July 22, 2025			
	Activity	Location	Assigned To
6:00 AM – 7:30 AM	Wake-Up & Personal Grooming	University Terrace	Resident Assistant
8:00 AM – 9:00 AM	Breakfast	SSC**	Resident Assistant
9:30 AM – 10:30 AM	SAT Preparation – English Session	EASC*	Karen Carroll
10:30 AM – 11:30 AM	Robotic Activities	EASC*	Dr. Mei
11:30 AM – 1:00 PM	Lunch	SSC**	Student Assistant
1:30 PM – 4:00 PM	Robotic Activities	EASC*	Dr. Mei
4:30 PM - 6:00 PM	Dinner	SSC**	Student Assistant
6:30 PM – 9:00 PM	AI/Robotics Workshop.	EASC*	Dr. Zhang
9:30 PM- 6:00 AM	Retire to Rooms for the Night	University Terrace	Resident Assistant

Week 2			
Wednesday, July 23, 2025			
	Activity	Location	Assigned To
6:00 AM – 7:30 AM	Wake-Up & Personal Grooming	University Terrace	Resident Assistant
8:00 AM – 9:00 AM	Breakfast	SSC**	Resident Assistant
9:30 AM – 4:00 PM	Visit to the National Museum of African American History & Culture	Washington DC	Dr. Dodoo
4:30 PM – 6:00 PM	Dinner	SSC**	Student Assistant
6:30 PM – 9:00 PM	Robotic Activities	EASC*	Dr. Mei
9:30 PM- 6:00 AM	Retire to Rooms for the Night	University Terrace	Resident Assistant

Week 2			
Thursday, July 24, 2025			
	Activity	Location	Assigned To
6:00 AM – 7:30 AM	Wake-Up & Personal Grooming	University Terrace	Resident Assistant
8:00 AM – 9:00 AM	Breakfast	SSC**	Resident Assistant
9:30 A.M. - 10:30 A.M.	SAT Preparation – English Session	EASC*	Ms. Carroll
10:30 AM - 11:30 AM	Job & Career Counselling	EASC*	Dr. Queenan
11:30 AM – 1:00 PM	Lunch	SSC**	Student Assistant
1:30 PM – 4:00 PM	Minecraft Code Crafters	EASC*	Arumala/Nsah.
4:30 PM - 6:00 PM	Dinner	SSC***	Resident Assistant
6:30 PM – 9:00 PM	AI/Robotics Workshop.	EASC*	Dr. Zhang
9:30 PM- 6:00 AM	Retire to Rooms for the Night	University Terrace	Resident Assistant

Week 2			
Friday, July 25, 2025			
	Activity	Location	Assigned To
6:00 AM – 7:30 AM	Wake-Up & Personal Grooming	University Terrace	Resident Assistant
8:00 AM – 9:00 AM	Breakfast	SSC**	Resident Assistant
9:30 AM - 10:30 AM	SAT Preparation - English	EASC *	Ms. Carroll
10:30 AM - 11:30 AM	SAT Preparation - Mathematics	EASC*	Mohammed Salih
4:30 PM – 5:30 PM	Dinner	SSC**	Resident Assistant
6:00 PM – 7:00 PM	Student Presentations	EASC*	Ms. Carroll
7:30 PM - 8:30 PM	Closing Ceremony	EASC*	ALL PSI STAFF
9:00 PM –	PARTIPANTS DEPART FOR HOME		
OR			
9:30 PM- 6:00 AM	Retire to Rooms for the Night	University Terrace	Resident Assistants

* EASC - Engineering and Aviation Science Complex

**SSC – Students Services Center

***NASA WFF – NASA Wallops Flight Facility

2025 Goals and Core Focus Area.

The Goals were as follows:

- ❑ **Goal 1:** Enhance female, historically underserved and underrepresented high school students' STEM identity, skills, and knowledge by engaging them in NASA-based STEM learning activities in aerospace and aeronautics.
- ❑ **Goal 2:** Increase female, historically underserved and underrepresented high school students' preparedness for college degree programs by building a powerful connection to a HBCU-University of Maryland Eastern Shore's faculty mentors/advisors, and peers who share interests in STEM.
- ❑ **Goal 3:** Increase female, historically underserved and underrepresented high school students' awareness of STEM careers by enabling connections to STEM professionals and NASA's missions.

The key focus areas addressed were:

The Student Participants will be provided with opportunities to explore exciting fields in NASA Aerospace and Aeronautics missions.

❑ **Student Engagement Activities and Timeline**

- A comprehensive schedule was prepared for the Institute showing the daily locations of all activities

❑ **Field Trips**

- There were two field trips planned
- One to Dover Airforce Base Museum, in Dover, Delaware and the other to the National African American Museum of History and culture in Washington DC.

❑ **Logistics:** Implementation and management of residential logistics in 2025, including housing, meals, transportation, daily operations, and onsite coordination

- The Participants were housed in the University Terrace Hall; They were supervised by the Male and Female Residents; They were led to each activity and the cafeteria for meals (breakfast, lunch and dinner) by a Male and female student assistants. For the field trips, buses were rented.

❑ **Our current partners for 2025 are the NASA Wallops Flight Facility, the Math Science Leadership (MSL) and the Education Solutions Company.**

2025 Recruitment process: Visiting high schools; Institute's Webpage and mailing Application Packages to high schools, parents and guardians

Education Solutions – Making a World of Difference

Educational Solutions Company is a premier charter management organization that has served the Central Ohio community for nearly 20 years. Educational Solutions Company manages and serves a diverse student population with respect to student academic growth and to utilize evidence-based educational practices. Education Solutions Company has served well in bridging language and cultural barriers for its diverse student population. It is their vision to prepare students academically, socially and morally to become effective contributors to society with a focus on Real World Learning and career exploration.

In support of the NASA Space Act Agreement with the University of Maryland Eastern Shore, the NASA MUREP Pre-College Program had hosted twelve students from the Education Solutions

Charter School out of Columbus, Ohio in which they toured Balloons, Sounding Rockets, SmallSats, Launch Range operations and the island launch pads. At the end of the visit, Dr. Robert Stephens, executive director of Educational Solutions Charter School, remarked, “Our young people’s eyes were widely opened to see firsthand science and aviation technology as WFF professionals shared insight on space atmospheric test operation and various missions across WFF and NASA.” Thanks to the NASA MUREP Pre-College Program for the gracious support and leaving a lasting impression on the students from the Education Solutions Charter School.

Contact Information:

Dr. Estella Stephens, CEO/Superintendent

Dr. Robert Stephens, Executive Director

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Columbus, OH 43219

Phone: (614) 299-1007

Fax: (614) 299-3684

Key Achievements to Date

- Recruitment of Participants
- Procuring Instructional Materials
- Completion of Background Checks on all Institute Staff.
- Discussion Meeting and Preparations to make the 2025 Institute a success

Potential risks and areas of concern

- Not being able to recruit the male student Residential Assistant

Planned mitigations and preventative measures

- Continue search for a male Resident Assistant

☐ Highlights and success stories

- One Student came from Louisiana, and two Students came from Atlanta, Georgia to attend the Institute.
- Video clips for these Participants will be sent later.
- Met De Kerra Marshall, HAWKS MUREP PSI (Cohort of Summer 2023) at the UMES IT Front Desk. She is now a sophomore in the UMES Aerospace Engineering Program.

Lessons Learned

The Lessons Learned included the following:

1. To start the processes of preparing for the Institute very early preferably in January including recruitment of student participants and undergraduate student workers, soliciting for appropriate Activities from Scientists, Engineers, Researchers and Professors, procurement of materials and equipment and securing transportation for Field Trips.
2. To explore ways and means of getting Institute's Staff, Professors and STEM Experts to be more involved in the affairs of the Institute.
3. The PI should be more involved in the University's Administrative and Financial Systems and Reporting.
4. To work with the Professors to develop more hands-on oriented Activities.

2025 PLANNED ACTIVITIES

The planned Activities are

ACTIVITY I VR/AR and AI/Robotics Workshops **Dr. Lei Zhang**

I. Activity Descriptions:

1. Summer VR/AR Workshop

This summer we are planning to run an enhanced session to introduce high school students to the transformative potential of virtual and augmented reality. The workshop will combine interactive lectures, hands-on tutorials, and immersive technology demonstrations to provide participants with a comprehensive introduction to VR/AR concepts and applications.

The workshop will provide students with foundational skills in VR game design using Unity and hands-on experience with leading VR/AR devices. We aim to expand the learning experience by incorporating advanced smart glasses that offer enhanced visual and interactive capabilities. These devices will not only enrich the technical content but also enable students to explore cutting-edge applications in both educational and creative fields.

The first is an introductory lecture. An overview of VR/AR technologies will be presented, discussing their technological components, current trends, and potential applications across various sectors. Then, there will be tutorials and hands-on sessions. Students will engage in a tutorial on creating immersive experiences using Unity. They will then have the opportunity to interact with VR devices, learning through direct application.

To further enhance this hands-on experience, we plan to integrate the following two items into our workshop, GOOVIS Art HMD Smart Glasses and VITURE Pro XR/AR Glasses. These smart

glasses will provide students with enhanced immersive experiences, allowing them to better understand the nuances of AR applications and interaction design.

The next will be an interactive discussion and reflection session, which will conclude with an open discussion where students can share their experiences, discuss potential real-world applications, and provide feedback on the new equipment's performance and usability.

The workshop offers students a realistic and interactive demonstration of VR/AR technologies. By using state-of-the-art devices, students will acquire more advanced technical skills in VR/AR development, preparing them for future academic and career opportunities in the field. The improved immersive experience is expected to further spark student interest in emerging technologies, thereby fostering creativity and encouraging innovative thinking in design and engineering.

This activity not only aligns with our goal of providing high-quality, experiential learning but also supports our ongoing efforts to collaborate with industry leaders in the tech sector. The

requested items are essential for ensuring that our workshop remains at the forefront of VR/AR educational technology.

2. AI-Robotics Workshop (Three Sessions)

The AI-Robotics Workshop is a comprehensive activity divided into three interactive sessions that emphasize hands-on robotics, intensive programming, and artificial intelligence. In addition to learning hardware assembly and system integration, students will engage in heavy programming practices and be strongly encouraged to leverage the latest AI tools, such as ChatGPT develop solutions and implement them. This approach will ensure that participants gain valuable experience with modern AI technologies and applications throughout the workshop.

a. Session 1: MakeBlock Rover Assembly and Maze Challenge

Before this session, students will form five teams of three to assemble a MakeBlock rover kit and control it via their cellphone. Each team collaborates to build a functional rover and then will navigate their rover out of a maze constructed on the first floor of the EASC building at UMES. This session fosters teamwork, introduces basic robotics assembly, and enhances problem-solving skills in real-time control environments.

b. Session 2: MakeBlock Rover Upgrade with Raspberry Pi

In this session, students will enhance the capabilities of the MakeBlock rover by integrating a Raspberry Pi to create a programmable platform with advanced functionalities. Students will upgrade their assembled rovers by integrating a Raspberry Pi, enabling more complex operations. Pi cameras will be provided to add vision capabilities, facilitating sensor-based interactions and advanced task performance. Intensive programming practices will be incorporated as students code the upgraded system, preparing them for more sophisticated applications.

This session promotes skills in programming, hardware integration, and advanced robotics, enabling students to explore the potential of programmable platforms.

c. Session 3: AI Robot Assembly and Play

In this session, students will be introduced to artificial intelligence applications in robotics using the SunFounder PiCar-X AI kit.

Each team will receive a SunFounder PiCar-X AI kit to assemble an AI-powered car. They will experiment with built-in AI functionalities through hands-on assembly and interactive play. Heavy programming tasks will challenge students to implement AI-driven features, with a strong recommendation to use modern AI tools, such as ChatGPT, to assist in developing and troubleshooting their code.

This session exposes students to advanced AI technologies, including machine learning and sensor integration, while reinforcing practical programming skills. By incorporating

AI tools into their workflow, students will gain firsthand experience with state-of-the-art applications in robotics and artificial intelligence.

The AI-Robotics Workshop, structured as a single activity with three sequential sessions, is designed to progressively build students' technical skills and confidence in emerging technologies. This workshop supports enhanced Learning, by integrating hands-on assembly, intensive programming, and AI exploration, students gain practical experience and technical competence. Each session builds on the previous one, ensuring an integrated understanding of robotics—from basic assembly to advanced, AI-driven applications. Collaborative projects and real-world challenges foster creativity and prepare students for future academic and career opportunities in STEM. The emphasis on heavy programming practices and the use of AI tools like ChatGPT ensures that students are not only learning traditional robotics skills but are also engaging with the latest technologies shaping the future.

ACTIVITY II An Integrative Communication Analysis Framework for Team Collaboration and Personal Self-Navigation of Performance Pathways – Dr. Willie Brown & Dr. Ibibia Dabipi

We will use Case Scenarios and the Lifecycle-oriented Roadmap (LoR) Specification Template An Integrative Communication Analysis Framework for Team Collaboration and Personal Self-Navigation of Performance Pathways to Assess Outcome-to-Solution (OtS) Process-Driven Developments: We will establish scenarios that will be NASA aligned.

ACTIVITY III App Development with Apple Xcode Dr. Weiwei Stone

1. Overview

This proposal outlines a structured instructional module for a summer program targeting high school students, focused on introducing mobile app development using Apple's Xcode platform and the Swift programming language. The program is designed to provide students with hands-on experience in both the technical and creative aspects of app creation.

2. Objectives

The goals of this instructional module are to:

- Introduce students to the **Xcode development environment**.
- Teach the basics of **Swift programming language**, including core syntax and logic structures.
- Guide students through the process of **designing user interfaces** using Interface Builder and Auto Layout in Xcode.
- Develop students' understanding of **graphic design and color theory** using online tools such as Canva and Adobe Color.

3. Instructional Plan

The program will be project-based and student-centered. Instructional activities will include:

- **Xcode Orientation:** Navigating the interface, creating new projects, using the simulator, and understanding the build process.
- **Swift Programming Basics:** Variables, data types, control flow, functions, and simple logic building.

- **GUI Design with Interface Builder:** Drag-and-drop layout creation, storyboard management, Auto Layout for responsive design, and UI testing.
- **Creative Design Tools:** Introduction to free graphic design platforms for creating visual assets such as icons, splash screens, and background images.
- **Color and Visual Design Principles:** Practical guidance on color harmony, accessibility, and branding aesthetics.

4. Expected Outcomes

By the end of the program, each student will:

- Develop a fully functional iOS app prototype.
- Demonstrate basic competency in Swift and Xcode.
- Create user-friendly, visually appealing app interfaces.
- Apply basic principles of visual and interactive design.

The program will conclude with a mini showcase, where students can present their app prototypes and reflect on their learning journey.

5. Resources Required

- Mac computers with Xcode pre-installed
- Internet access for online design tools (e.g., Canva, Adobe Color)
- Optional: Access to iPads or iPhones for deployment (not required)

6. Conclusion

This module will provide high school students with valuable exposure to real-world software development skills, while encouraging creativity and confidence in technology. The instructional experience will be tailored to beginner-level learners and paced to balance technical rigor with enjoyment.

ACTIVITY IV The Basic Concepts of the Physics of Electricity and Magnetism

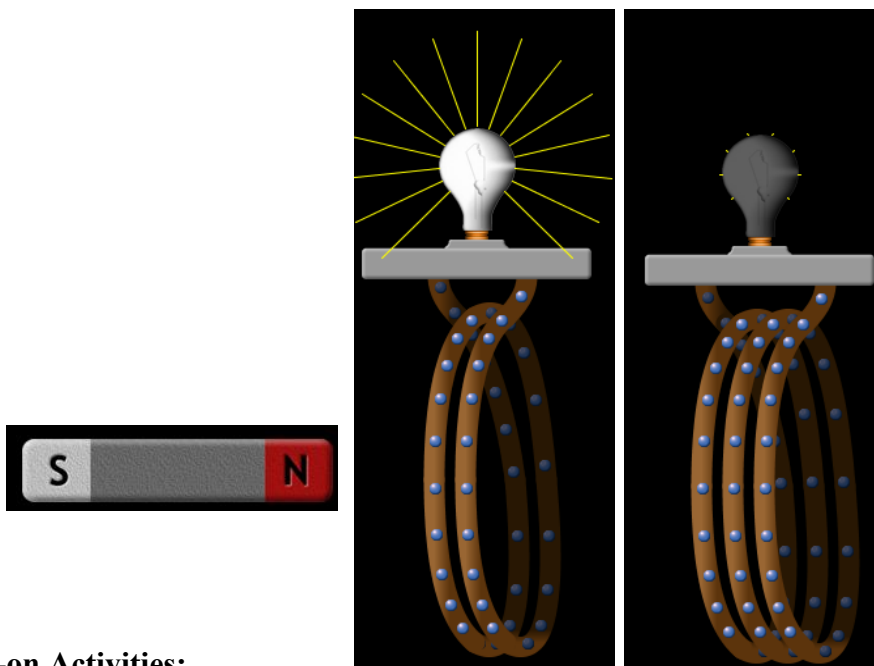
Dr. Kausik S Das

In this NASA Precollege Summer Institute proposal, we plan to introduce students the basic concepts of the physics of Electricity and Magnetism through some interactive simulations, hands-on activities, and their applications in cutting-edge technologies, such as green energy generation, wireless energy transfer, superconducting quantum magnetic levitation etc. These activities will be repeated every year.

Interactive Simulations using PhET (acronym for Physics Education Technology)

PhET is a fun, free, interactive, research-based science and mathematics simulation platform. It was founded in 2002 by Nobel Laureate Carl Wieman and used by millions of students and educators throughout the world. PhET sims are based on extensive education and research and engage students through an intuitive, game-like environment where students learn through exploration and discovery. In this project we plan to use Faraday's Electromagnet PhET lab extensively to learn about the

concepts of electromagnetic induction, how a motor works and how to construct a wireless charger.



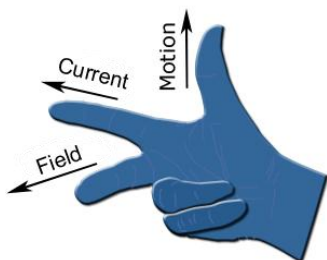
Hands-on Activities:

1. Construction of a homopolar motor, world's simple motor:

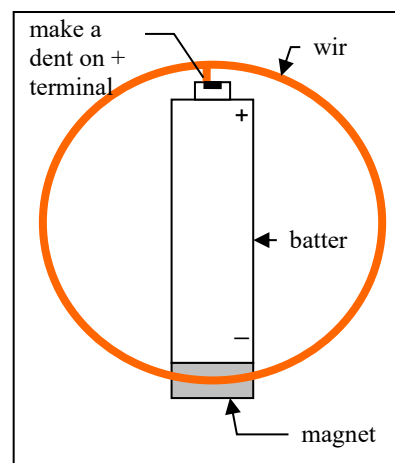
In this activity the students will construct a simple motor using an AA battery, a magnet and a copper wire. Detailed procedure is given below. Once they successfully construct the motor, they can keep it and take back home for future use.

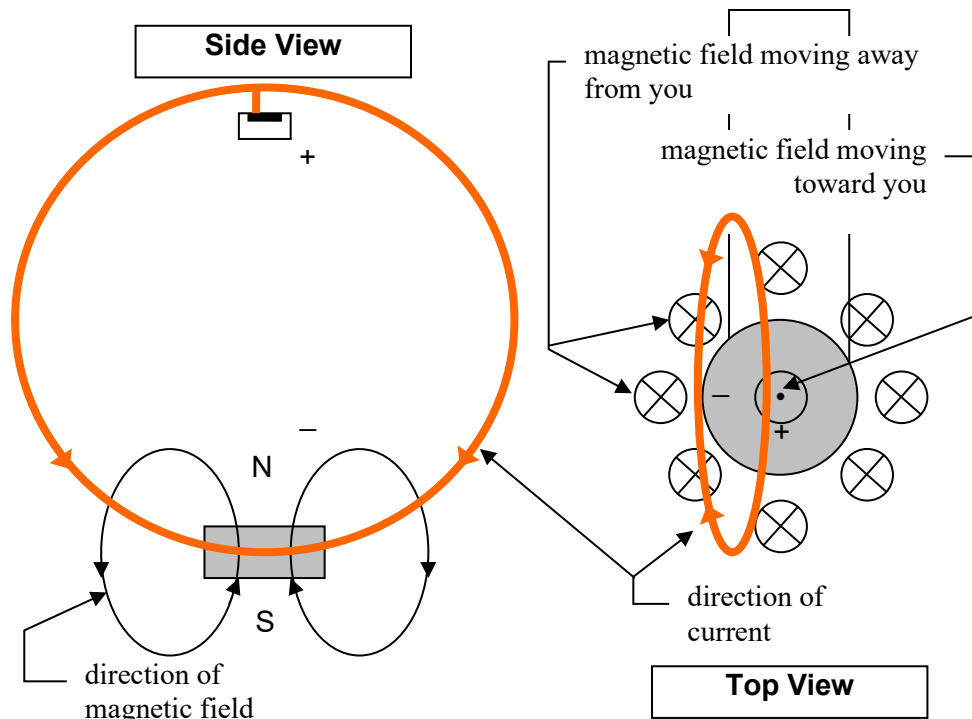
Principle: A conductor (wire) carrying a current will experience a **FORCE** depending on its orientation with respect to a magnetic field. This is known as the Lorentz Force.

A convenient mnemonic to find the direction of the resulting movement is the Right Hand Rule.



For our motor, we have a very strong, localized magnetic field at the bottom of the battery. (Remember, don't put the magnet near your electronic devices or credit cards!) When we short out the battery with the wire, we get a large current moving through the wire!

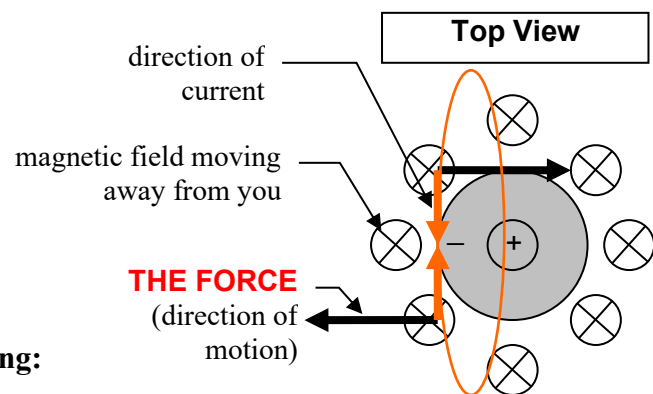




Now we will use the Right Hand Rule! We're only interested in the current running through the bit of wire close to the magnet.

Q: Can you tell which way the wire will move?

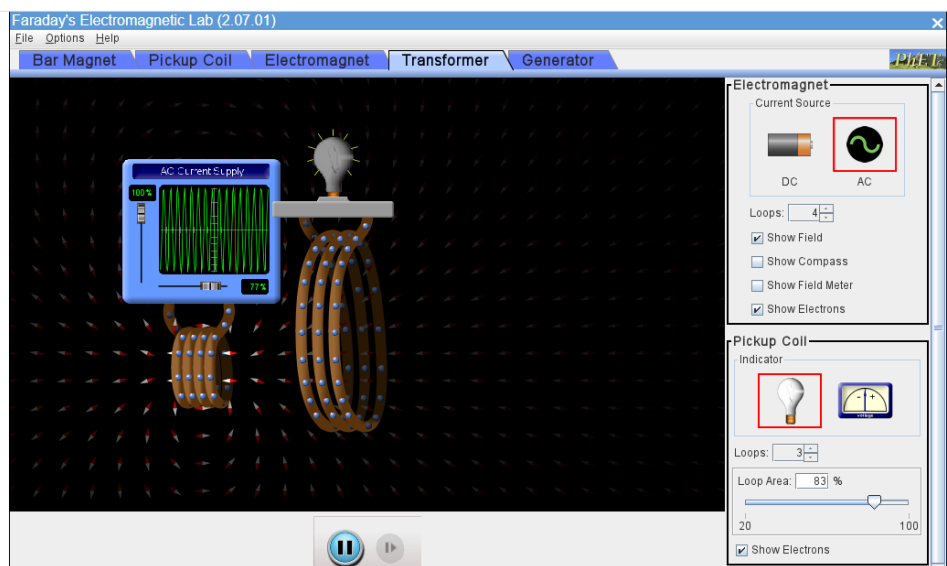
If you flip the magnet, the wire will start spinning the other way!
Try it yourself!



Activity 2: Demonstration of wireless charging:



In this hands-on demonstration students will learn how wireless energy transfer works and how this principle is used in wireless charging of modern cellphones. This hands-on activity will be supplemented by the PhET simulation on electromagnetic induction, where the students will investigate the effect of several key parameters, such as number of turns in primary and secondary coils, strength of alternating current in the primary coil, loop area and the distance between the coils.



Activity 3: Superconducting Hoverboard project using Quantum Magnetic Levitating Superconductors.

In this activity/demonstration students will investigate quantum levitation using a MagLev kit. They

will explore the following key concepts:

Superconductors

Superconductors are a perfect example for a Quantum Physics that is macroscopic, large and accessible to play with.

Superconductivity is created by having discrete energy levels AND by having a large energy gap between the lowest energy state and higher available states.

Besides being perfect electrical conductors, superconductors exhibit the strangest magnetic properties:

Meissner Effect – diamagnetic expulsion of external magnetic fields. The superconductor expels magnetic fields by becoming an opposite magnet.

Flux pinning or Quantum Locking – the ability to lock magnetic fields. The locking traps the superconductor in mid air, allowing it to levitate and suspend in a surrounding magnetic field.

The combination of both allows us to create frictionless, levitating motion and a true hoverboard experience.

Activity: Hoverboard, Frictionless Motion

Activity: Build a straight track by placing the magnets on the steel sheet such that adjacent magnets, side-by-side, attract each other (opposite orientations) and magnets along the track repel each other. Try to push magnets along the track as close to each other as possible.

Cool the levitator and place it on the track.

Observe – The Superconductor is locked on the track AND can move freely along the straight line.

Repeat this track shape with a spacer between the two rows. The magnets across the spacer should attract each other which will help keeping the spacer in place.

Cool the levitator and place it on the track. Explore the frictionless motion.

Observe and think:

- Can you tell the difference in the levitation between the two options?
- Draw the field lines on both cases and explain the different behaviors due to the magnetic field.



ACTIVITY V Robotic Activity

Dr. Lanju Mei

Description: In this activity, we will explore the dynamic response of a dynamic system consisting of a mass, spring and a damper. Fundamental knowledge of vibrations will be discussed. We will then work on building model to simulate and tune the response of the system for real-world scenarios like vehicle suspension or building vibration control.

ACTIVITY VI Minecraft Code Crafters

Course Overview

Welcome to the Minecraft Code Crafters class provided by the M.A.R.S program. Here you'll become a master coder by shaping your own Minecraft worlds! Over 14 days at our camp, you'll use block-based coding to create cool builds, mini-games, and adventures in Minecraft! From coding secret traps to spawning treasure, you'll have fun, work together, and finish with a "Minecraft Masterpiece" showcase! Everything happens right here at camp, so just bring your excitement and creativity!

Learning Objectives

By the end of the camp, students will:

1. Understand basic coding ideas like variables, loops, and conditionals using block-based coding in Minecraft.
2. Make fun features like moving bridges, talking characters, or games with drag-and-drop blocks.
3. Team up with friends to build and show off a final Minecraft project.

4. Feel great about beginner coding and problem solving through playful challenges.

Daily Schedule and Tasks

Week 1: Craft the Basics

Every day fits learning and fun into 2 hour classes using block-based coding!

Day 1: Welcome to Minecraft Code Crafters (2 hours)

Warm-up (15 min): Introduce yourself and tell us your favorite thing about Minecraft to get excited/break ice.

Intro (15 min): Watch a quick demo of block coding like dragging a “place block” to stack wool and see how it works in Minecraft.

Set Up (25 min): Open Minecraft Education Edition on laptops/desktops, join a shared world, and drag a “Say Hi” block to make your character talk.

Daily Task (45 min): Drag blocks to build a welcome sign like “Camp Rocks!” or “I Love Minecraft!” with stone or wood use “place block” and pick a spot in the world. Add a fun block stack nearby (ex. 3 emeralds).

Wrap-up (20 min): Hop around to see everyone’s signs, have campers vote on a “Coolest Stack” winner, and handout rewards.

Day 2: Numbers (2 hours)

Recap (10 min): Go over yesterday’s signs, ask “who made the tallest stack?”.

Lesson (20 min): Learn about numbers with blocks, drag a “number” block set to 5, then use it to stack 5 blocks high. See how changing the number changes the stack.

Daily Task (50 min): Build a tower by dragging a “repeat” block and a “place” block, set the repeat to a number you pick (like 4 or 6) and choose a block (like gold). Add a sign on top with your initials.

Break (20 min): Explore a fun pre-made world (ex. a jungle) together for a quick breather.

Wrap-up (20 min): Check out everyone’s towers, fix any that don’t stack right, and hand out rewards.

Day 3: Numbers cont. (2 hours)

Recap (10 min): Quick tower show-and-tell, what’s your block choice? (Gold, Diamond, etc.)

Lesson (20 min): Play with numbers more, drag a “number” block to set how many animals spawn (ex. 3 cows). Test how it changes the game.

Task (50 min): Spawn a mini farm, drag a “repeat” block set to 3 or 5, add “spawn animal” (ex. cows or sheep), and watch them appear. Add a fence with “place block.”

Break (20 min): Corral the animals in pairs count how many you can find!

Wrap-up (20 min): Share farms; tweak any runaway cows, and handout out rewards.

ACTIVITY VII Building a Better Life - Concrete Steps for Success Workshop

Overview:

To have a great day and a great life begins with attitude. We explore being proactive, grateful, positive and responsible so that you are in control of your thoughts and your life. We address the importance of goal setting and how to write meaningful lifetime and daily goals. We discuss the value of time and how to manage one’s time most effectively. We discuss communication skills for leadership and success. We discuss financial tips for success and the time value of money. We conclude by putting it all together into how a great day may look!

Detailed Synopsis

ATTITUDE – We explore being proactive, positive, responsible and in control. We discuss what is success and what makes a great life. We look at what makes a good habit. We then discuss the Law of Cause and Effect, the Law of Belief, the Law of Expectation, the Law of Attraction, the Law of Correspondence, the Law of Concentration and the Law of Substitution. The overall message is “we become what we think about” and if you change your thinking, you can change your life.

GOAL SETTING FOR SUCCESS – Goal setting is the master skill of success. Writing out goals is one of the most important things we can do. Yet, less than 3% of people have ever taken the time to write out their lifetime goals. We discuss the importance of goal setting and value of writing down goals. We discuss how to develop major goals, a “major definite purpose” and corresponding detailed plans of action. We will do some exercises in which participants can write out their goals and action plans. We then show how the same personal goal setting methodology can be used effectively for professional goal setting for businesses and government, otherwise known as strategic planning.

TIME MANAGEMENT - Do you feel like you never have enough time to get everything done? At the end of a busy day, do you wonder if you accomplished anything important? Do you feel like you are spinning your wheels? Do you wonder what the top of your desk looks like (is it wood or metal)? This overview of time management looks at life management, setting priorities based on your goals and then offers tips to avoid wasting time. Come listen to how you can improve your life at work and at home by managing your time better. Specifically, the time management portion will cover:

- Definition of Time
- Life Management versus life leadership
- Definition of Time Management
- Keys to Effective Time Management
- Time Management Matrix
- 7 Ways to Get More done Delegating
- Time Wasters
- Organizing Desk
- Other Time Management Best Practices
- Meetings
- Avoiding Procrastination

COMMUNICATING FOR SUCCESS – Excellent leaders and project managers are great communicators. All successful people are excellent communicators. Stephen Covey, in his outstanding book, “The 7 Habits of Highly Effective People,” addresses Habit 5, “Seek First to Understand and Then to be Understood” as the habit of excellent communication skills. This seminar will address various time-tested communication principles and skills including body language, active listening and persuasive speaking that help enhance your success at work and at home. We will explore ways to communicate better in person (formally and informally), over the phone, via e-mail and at meetings. We will also review the soft skills of communications that help you build a better life.

PERSONAL FINANCES FOR SUCCESS – We talk for approximately 45 minutes to one hour about tips for financial success and the time value of money. This segment addresses investing, saving and credit card debt. This section can be expanded as many people have great interest in this subject.

How can you not AFFORD to make the time to learn some personal financial strategies!!! This 50 minute seminar on personal financial management looks at the time value of money, target savings rates, possible investment strategies, the reward for investing early and the penalty for delaying investing for retirement, the penalty of credit card debt and some other tips for achieving financial independence (having enough money that you do not have to work if you choose not to work). An eye opening example is if you begin at age 22 putting away \$1,200 per year and getting an average of 10% return for 50 years, you will have \$1.397M at age 72. If you wait 10 years and begin at age 32 putting away \$1,200 per year for only 40 years, you will have \$531k. If you wait 20 years and begin at age 42 putting away \$1,200 per year for 30 years, you will have \$197k at age 72. How do you get an average of 10% return on your money? Come to the seminar and see.

MANAGING CHANGE FOR SUCCESS – We discuss the need to change, why people tend not to change and ways to implement successful and positive change. This segment can often be combined with the Attitude segment or can be stand-alone.

PUTTING IT TOGETHER TO MAKE A GREAT DAY – We conclude by wrapping attitude, goal setting and time management together and describing what makes a great day.

LEADERSHIP FOR SUCCESS: Where are you on the leadership scale? How can you improve your leadership effectiveness and increase your influence to obtain better results that lead to achieving your personal and organization's goals and strategies? This workshop will address the attributes of both personal and organizational leaders. We will look at the types of leaders and the five levels of leadership: Position, Permission, Production, People Development and Pinnacle. The seminar will explore tips on becoming a more effective leader including having a leadership attitude, setting goals and strategies, managing priorities, delegating, communicating and handling change.

UNDERSTANDING AND WORKING WITH THE MULTI—GENERATIONS IN THE WORKPLACE:

With the percent of baby boomers in the workplace rapidly declining from 50% to currently less than 20% and the rise in the percentage of millennials (Generation Y) now exceeding Generation X (33% versus 30%), working between generations is increasingly challenging. This one-hour workshop explores the unique traits of each generation and then addresses ways to better work together and communicate among the diversified generations.

TECHNICAL WRITING FOR SUCCESS: Similar to communicating for success, how do you persuade and influence people to take desired actions or understand what you wish to convey using the written medium. This course looks at how to write technical letters, memos and e-mails properly and concisely to deliver important messages and develop rapport with your readers.

INTERVIEWING FOR SUCCESS: This program explores best practices in interviewing to

win a job. It looks at the hiring process and how to deliver a great interview and how to follow up to win the position.

RESUMES AND COVER LETTERS FOR SUCCESS: How do you get an interview for your dream job? This course looks at effective cover letters and resumes to open-the door to win a job interview.

EVERYTHING YOU ALWAYS WANTED TO KNOW ABOUT TELEWORKING BUT DID NOT ASK

BECAUSE YOU WERE ON MUTE: With COVID-19 forcing many people to work remotely from their homes since March 2019, we are all learning how to more effectively telework. This session will provide lessons learned for how to be more effective when working remotely. It will include how to be more effective communicators via e-mail, phone and teleconference platforms. It will also address how to more effectively manage one's time with some proven time management tips that directly relate to working remotely.

ACTIVITY VIII Critical Thinking Through CHESS Workshop

By Dr Joseph N. D. Dodoo

Introduction

It is generally considered by most educators that playing chess is known to enhance a variety of cognitive skills and mental well-being.

These cognitive benefits include but are not limited to

- Improved Memory:
- Enhanced Concentration and Focus:
- Sharpened Critical Thinking Skills:
- Boosted Planning and Foresight:
- Increased Creativity:

Overall, chess provides a comprehensive mental workout, enhancing cognitive skills and contributing to a positive mental well-being for people of all ages.

For these reasons, one component of the MUREP program has been devoted to one weekend workshop to teach and engage the students in a game of chess, both as a recreation and also to reap the benefits described above.

Objective

The students will learn the fundamental rules of chess, basic setup of the chessboard, a comprehensive introduction to chess, and the essential concepts that every chess player should know.

The workshop will last about 3 to 4 hours. At the end of the session, the students will be permitted to retain the chessboards and encouraged to challenge themselves for the duration of the program.

ACTIVITY IX SAT English and Mathematics Preparation

Effective Communication for Leadership Ms. - Karen Carroll
Overview

The objective for this course is to provide opportunities for growth in the area of communication across academic, social, and professional spaces. This course will focus on understanding the importance, purpose and process of communication, and the importance of expression as a means of improving possibilities for the future.

Each day will center on a specific understanding of the topic and will build on what is presented in earlier units.

Day 1

- Communication Matters
 - Goals for the Future-Setting SMART Goals
 - Why? How? What?

Day 2

- Understanding Your Audience
 - “Code Switching”
 - Elevator Speeches

Day 3

- Writing to Impress
 - Test Scores Will Only Get You So Far

Day 4

- Writing Resumes and Biographies
 - Knowing How to Value Your Own Worth

Day 5

- Preparation for Spong SAT Testing
 - Understanding the Test

Day 6

- Focusing on the Future
 - Finding Your Passion, Purpose, and Path

Day 7

- Oratorical
 - Speak It Into Existence

Day 8

- TEDtalking
 - Preparation for EOP

Day 9

- End of Program Ceremony
 - Presentations

SAT Mathematics Prep – 4-Session Lesson Plan - Mohammed Salih

Objective:

To review core math concepts tested on the SAT and build students’ confidence and accuracy through guided practice and independent problem-solving.

Target Audience:

High school juniors/seniors preparing for the SAT.

Session 1: Math Foundations & Core Skills Review

Duration: 1 hour

Goal: Build foundational skills essential for SAT Math.

Topics Covered:

- Structure of the SAT Math test (calculator & no-calculator sections)
- Arithmetic and number properties
- Algebraic expressions and linear equations
- Fractions, percentages, ratios
- Basic problem-solving strategies

Activities:

1. **Warm-up (5 min):** Mental math and quick review quiz.
2. **Mini-lecture (25 min):** Explain key concepts with examples.
3. **Guided Practice (20 min):** Work through 4–5 sample SAT-style problems together.
4. **Q&A and Wrap-Up (10 min):** Recap tricky areas, assign practice.

Homework:

- Review handout of math formulas (provided).
- **Assignment:** Complete Practice Test #1 (No Calculator section only).

Session 2: Guided Practice – Test #1

Duration: 1 hour

Goal: Solve a full-length SAT practice test with detailed explanation.

Activities:

1. **Review Homework (10 min):** Discuss mistakes from no-calculator section.
2. **Guided Walkthrough (45 min):** Solve Practice Test #1 (Calculator section) together.
 - Focus on reasoning and time-saving tips.
 - Emphasize algebra, systems of equations, and functions.
3. **Recap (5 min):** Discuss performance patterns.

Homework:

- **Assignment:** Complete Practice Test #2 (Full math section - timed).

Session 3: Guided Practice – Test #2

Duration: 1 hour

Goal: Review and explain Test #2 in detail.

Activities:

1. **Quick Refresher (5 min):** Focus on common formula reminders.
2. **Error Analysis (25 min):** Go over common mistakes from Test #2.
3. **Step-by-Step Problem Solving (25 min):** Solve key problems from Test #2.
 - Geometry and data interpretation emphasis.
4. **Wrap-Up (5 min):** Tips for test day (pacing, skipping, checking).

Homework:

- **Assignment:** Complete Practice Test #3 independently (Full section, timed).
- Submit with written steps for each problem.

Session 4: Final Review & Strategy Session

Duration: 1 hour

Goal: Reinforce strategies, clarify difficult topics, and finalize test-taking techniques.

Activities:

1. **Check-In (5 min):** Brief discussion of Test #3 results.
2. **Targeted Review (20 min):** Focus on:
 - Student-selected "trouble spots"
 - Hard problems from Tests #2 and #3
3. **Live Speed Round (20 min):** Timed practice (10 questions – mix of no-calc and calc).
4. **Strategy Summary & Motivation (15 min):**
 - Tips for test day
 - Common traps and pacing advice
 - Encouragement and confidence-building

Final Assignment:

- **Optional:** Practice Test #4 (with self-timing and score analysis).
- Review score trends and identify next steps for study.

BREAKDOWN OF NUMBER OF CONTACT HOURS

ACTIVITY	Description	Proposed Contact Hours
I	VR/AR & AI/Robotics Workshops	5
II	An Integrative Communication Analysis Framework for Team Collaboration and Personal Self-Navigation of Performance Pathways	10
III	App Development with Apple Code	5
IV	The Basic Concepts of the Physics of Electricity and Magnetism	5
V	Robotic Activities	6
VI	Minecraft Code Crafters	6
VII	Building a Better Life – Concrete Steps to Success Weekend Workshop	8
VIII	Critical Thinking through CHESS Workshop	5
IX	SAT English and Mathematics Preparation	6
X	STEM Mentoring	5
XI	Job Shadowing	5
XII	Field trip to Dover Air Force Base	5
XIII	Guide to Aerodynamics	5
	Total Contact Hours	75

PHOTO GALLERY/STUDENTS IN ACTION



Figure 1 Participants practicing speaking and presentations



Figure 2 A Group photo after the Build A Better Life Workshop



Figure 3 Participants playing CHESS



Figure 4 Minecraft Class



Figure 5 Presentation by a Participant



Figure 6 Field Trip to Dover Airforce Base



Figure 7 Field Trip to Dove Air Force Base

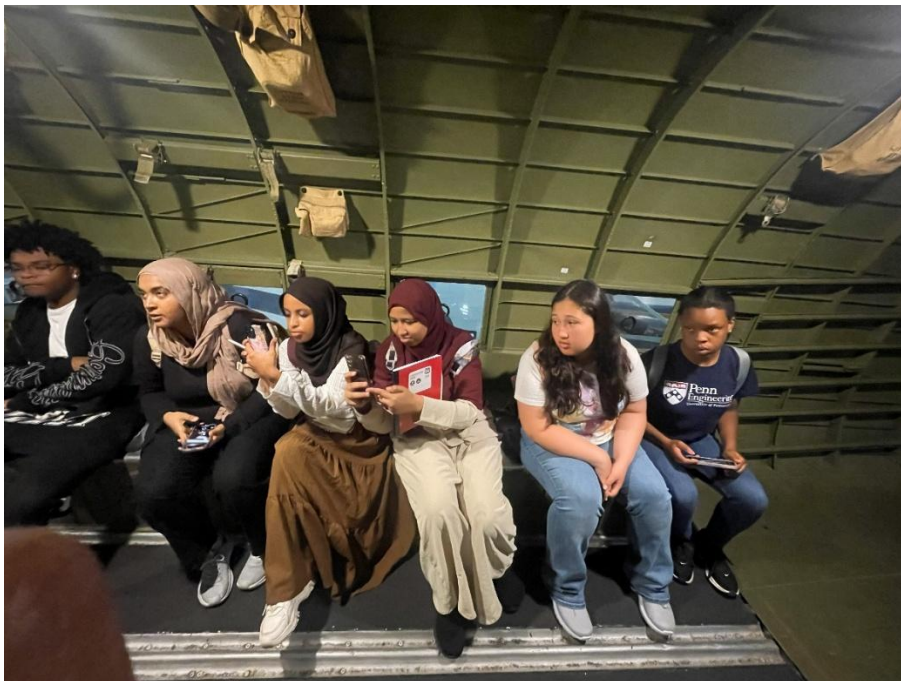


Figure 7A Field Trip to Dover Air Force Base



Figure 8 Field Trip to Dover Air Force Base



Figure 9 Participants in an English Class



Figure 10 HAWKS MUREP & OHIO Students



Figure 11 HAWKS MUREP & OHIO Students



Figure 12 General Session



Figure 13 Participants in a Physics Lab



Figure 14 Orientation in an Engineering Lab



Figure 15 A Group Presentation



Figure 16 Closing Ceremony Group Photo